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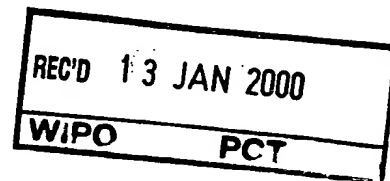
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I, KIM MARSHALL, MANAGER PATENT OPERATIONS hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. PP 7248 for a patent by KEYCORP LIMITED filed on 20 November 1998.



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MANAGER PATENT OPERATIONS

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ORIGINAL

PROVISIONAL SPECIFICATION

MULTIPLE SCHEME ELECTRONIC CASH SYSTEM

The invention is described in the following statement:

MULTIPLE SCHEME ELECTRONIC CASH SYSTEM

Technical Field

The present invention relates to smart cards, and in particular, to smart cards which, either solely or in conjunction with other purposes, are used to
5 provide electronic cash services.

Background Art

Schemes have been proposed by which customers could use a smart card - that is, a card incorporating a microprocessor - to effect a transaction which has been traditionally undertaken by cash. Often, these are low value
10 transactions where use of credit card or debit card type facilities is not convenient, particularly from the perspective of the vendor. Such applications may be, for example, newspapers, take away food outlets, public transport tickets, telephone services and numerous other applications.

Various schemes have been proposed and trialled in relation to such
15 electronic cash systems. Generally, the schemes involve a certain verified amount of electronic cash being deposited on the card, this cash being guaranteed by the scheme in some manner. Encryption schemes are used to ensure that the user can not fraudulently add extra value to the electronic purse. Examples of such schemes are Mondex TM, Chipper TM and Proton TM.

20 One aspect of the various competing schemes proposed or in use is that in general they are not interoperable. They use different encryption schemes and operating protocols, such that a terminal configured for one scheme will not be able to accept additional schemes, unless it is also configured to accept such additional schemes. The terminals for most such schemes require a specific
25 integrated circuit, known as a Secure Access Module (SAM) to be provided. The more SAMs that are required to be added to a terminal, the greater the cost of the terminal. One of the specific objectives of the electronic cash systems is to make the terminals inexpensive, so that they will be widely used by merchants. However, if each merchant is required to have a terminal supporting many
30 different schemes, due to a proliferation of such schemes in the community, and in order to do this each terminal must have multiple SAMs then the cost of the terminals will inevitably be higher.

It is an object of the present invention to provide an arrangement whereby terminals supporting only one scheme can be used by smart card holders who subscribe to another scheme.

Summary of Invention

5 Broadly, the present invention envisages providing, in addition to the single purse in a conventional smart card, an additional, escrow purse denominated in that scheme, with a software agent provided on the smart card. Thus, the agent is enabled to communicate with a terminal operating on a different electronic cash scheme, to transfer electronic cash according to that
10 scheme, and to meanwhile debit the main purse of the card scheme and credit the separate escrow purse within the smart card. Thus, the electronic funds are removed from the funds available on the smart card to the holder. The funds in the additional purse are marked and recorded, preferably via some ledger facility, as being transferred to the alternative scheme to the credit of the
15 particular merchant. When the smart card is later inserted into a more sophisticated terminal, the balance in the additional or escrow purse is reconciled, so that the funds can be transferred via the merchant's scheme to the merchant.

The advantage of such a scheme is that the agent can be implemented
20 purely in software within the smart card. The merchant's terminal needs only to support one of the schemes with which the agent is configured to operate, thereby reducing the cost of the merchant terminal. It is inherent in such a system that there needs to be a high degree of trust in the agent as it is mediating between schemes operating on different encryption techniques.
25 Each of these schemes operates independently and does not necessarily fully trust the other. Accordingly, the arrangement proposed is particularly applicable to relatively low value electronic cash transfers, where the amounts involved do not constitute significant loss if the transaction is not completed for some reason.

Whilst the advantage of the inventive arrangement are most clear where
30 a relatively low cost merchant terminal is used, it will be apparent that this arrangement could be used with more sophisticated terminals - for example, ATM type devices. Where on-line connections are available, from the terminal,

the transaction could be affected directly via the respective schemes and/or issuers. However, the present invention has greater advantages in the off-line situation, as it allows for the smart card to still reflect the correct value of available electronic cash in the customer - accessible purse, and to have an amount for later reconciliation stored in the escrow purse, which is not susceptible to variation or alteration by the card user. We have accordingly applied the term escrow - that is, the funds are held in this purse, pending later reconciliation, and are not available to the card holder for use in subsequent purchases.

10 Brief Description of Drawings

The present invention will be further described with reference to the accompanying figures, in which:

Figure 1 is a block diagram of the schematic operation of the smart card in communicating with a simple terminal.

15 Figure 2 is a schematic illustration of the operation of the inventive smart card with a more sophisticated terminal.

Figure 3 is a schematic illustration of the functional blocks within the smart card where the agent has multiple scheme functionality.

Detailed Description

20 The present invention will be described in relation to a smart card, which is envisaged as having only electronic purse type functionality. Whilst this may be the case, it is likely that other functionalities - for example, conventional financial services, identification or access functionality - may also be included on the smart card. Only the aspect dealing with electronic cash will be discussed. The smart card may be of any conventional type, subject to sufficient non-volatile memory to support the application described. The application will be discussed in the context of what would be described as Schemes A, B, etc - it would be appreciated that these could be any electronic cash or similar schemes. For example, apart from the broad schemes previously discussed, 25 they could include the ability to interoperate with specific schemes for telephone access or public transport. 30

With reference to figure 1, suppose a customer has a smart card, issued pursuant to Scheme A, and wishes to make a purchase from a merchant who has a terminal operable only under Scheme B. The smart card 10 is placed in communication with the terminal - this could be either via a non contact or contact technique - so as to establish communications link 30. After normal power-up procedures on the smart card, agent 20 determines that the terminal 40 operates under Scheme B, and then engages an appropriate interface. The purchase amount is advised, for example \$10.00, from the terminal to agent 20. After the appropriate identification procedures and authorisation has occurred - for example, a PIN number has been provided by the genuine card holder - agent 20 commences to perform the transaction. Electronic cash equivalent to \$10.00 is deleted from the balance of purse A, and is credited to the balance of the escrow purse 12, also operating under scheme A. Details of the merchant, date, terminal scheme, etc are stored in ledger 15, to enable later reconciliation. Agent 20 then advises the terminal of the transfer of an appropriate amount of electronic cash under Scheme B, such transfer to be completed once smart card 10 has been inserted into a terminal arrangement capable of reconciling the transaction. The merchants terminal 40 may optionally retain appropriate details of the card, user, amount and date for later checking against finalisation of the transaction. Low cost terminals dealing with low value transactions may not retain a log, and simply rely on the single log within the purchaser's card. Alternatively, the merchant's card may be used to retain such a log rather than the terminal.

Figure 3 illustrates schematically the arrangement of the agent 20 within smart card 10. The control software 25, after the card is powered up, determines the scheme in which the terminal operates - for example, this may be scheme B. It then selects from the schemes available to it - shown as interfaces 21 to 24 - the correct application to provide an appropriate interface, in this case scheme B. This provides also the correct protocols for interacting with a scheme B terminal, so that from the perspective of the terminal 40 it is interacting with a valid scheme B card. Each interface 21-24 also communicates with a respective scheme purse 26, 28, 29 and 30, distinct for each scheme. Alternatively, a single escrow purse could be used with some indicia to

associate the escrow purse with a particular scheme. A further alternative would be separate scheme A escrow purse for each scheme, but this is not preferred.

The control 25 debits the main purse operating under scheme A as appropriate for each transaction, and places funds in the escrow purse 26. It also debits the scheme B, C and D purses 28-30, so as the totals in these purses reflect the funds "owed" by the card to each alternative scheme. It will be appreciated that the total of the debits in each alternative scheme purse should match the amounts in the escrow purse flagged for each scheme.

The card user has access only to the balance available in purse A, and optionally the ledger, escrow purse, and purses B-D as read only values. The ledger 15 can only be rectified and reconciled once appropriate communications with the issuer, or at least a more sophisticated terminal supporting multiple schemes, occurs. The means of settlement could vary - however, in principle once the card is placed in a suitable terminal, the escrow purse 26 will be emptied, the scheme B, C and D purses 28-30 credited to a zero balance, and back-office operations conducted to ensure the transactions are reconciled with the various merchants, and an appropriate ledger entry made. Card 10 will then show an appropriate balance in purse A, with all other purses empty. Of course, this arrangement could be configured to allow the alternate scheme purses to be credited with scheme B, etc, electronic cash, upon request of the user at a suitable terminal.

It is noted that the alternative scheme purses may be maintained in a format suitable for the corresponding scheme without a full SAM or similar means being maintained for the alternative scheme.

Figure 2 illustrates a situation when, at some later time after transactions have occurred off-line, smart card 10 is presented to a more sophisticated terminal 50. Smart card 10 may well be inserted into terminal 50 for some other purpose than reconciliation - for example, obtaining an account balance. The terminal and smart card software interact using the details in the ledger and the escrow purse so as to reconcile the earlier off-line transaction, empty the escrow purse, and arrange transfer of the appropriate alternative scheme funds to the merchants.

In an alternative implementation, the smart card may retain a specific

purse under the alternative schemes. In this implementation, the agent would mediate transfers amongst these purses, subject to the overall security arrangements for the principal or A scheme. It will be apparent that the agent needs to be placed in a secure memory within the smart card, so that it is not
5 subject to alteration by parties other than the card issuer.

In a further application, a temporary escrow purse may be used to enable small value transactions i.e. several cents for a time period when operating a telephony device - to be added up, and the transaction finalised once the call is terminated. For example, the agent may be enabled to accept the "click"
10 protocol operating on the telephony service providers lines, so as to add up a progressive tally. At the end of the session, the proper amount could be debited from the A purse, and added to the appropriate escrow purse - for example, for one specific telecommunications provider or marked up to credit that provider through an alternative scheme.

15 It will be appreciated that the agent will simply select the appropriate scheme, based upon those present at the terminal. Initially, it would attempt to utilise its principal scheme, and utilise others in some order of hierarchy. However, the arrangement is such that the internal interfacing is transparent to the user - as far as the cardholder is concerned, all of these are occurring as
20 scheme A type transactions and a consistent interface is presented to him by the smart card at each terminal to which it is inserted.

It would be apparent that variations and additions are possible within the general inventive concept disclosed.

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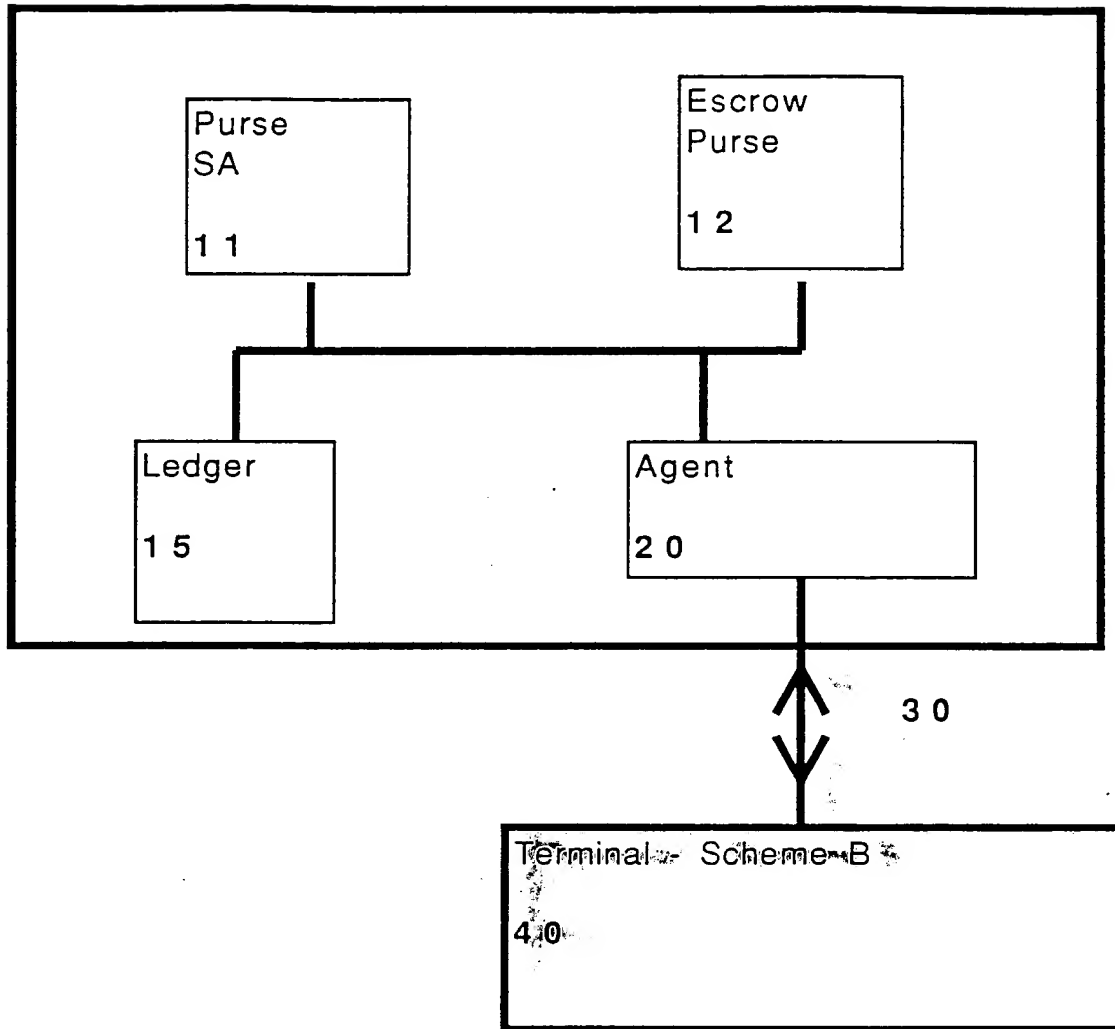


Figure 1

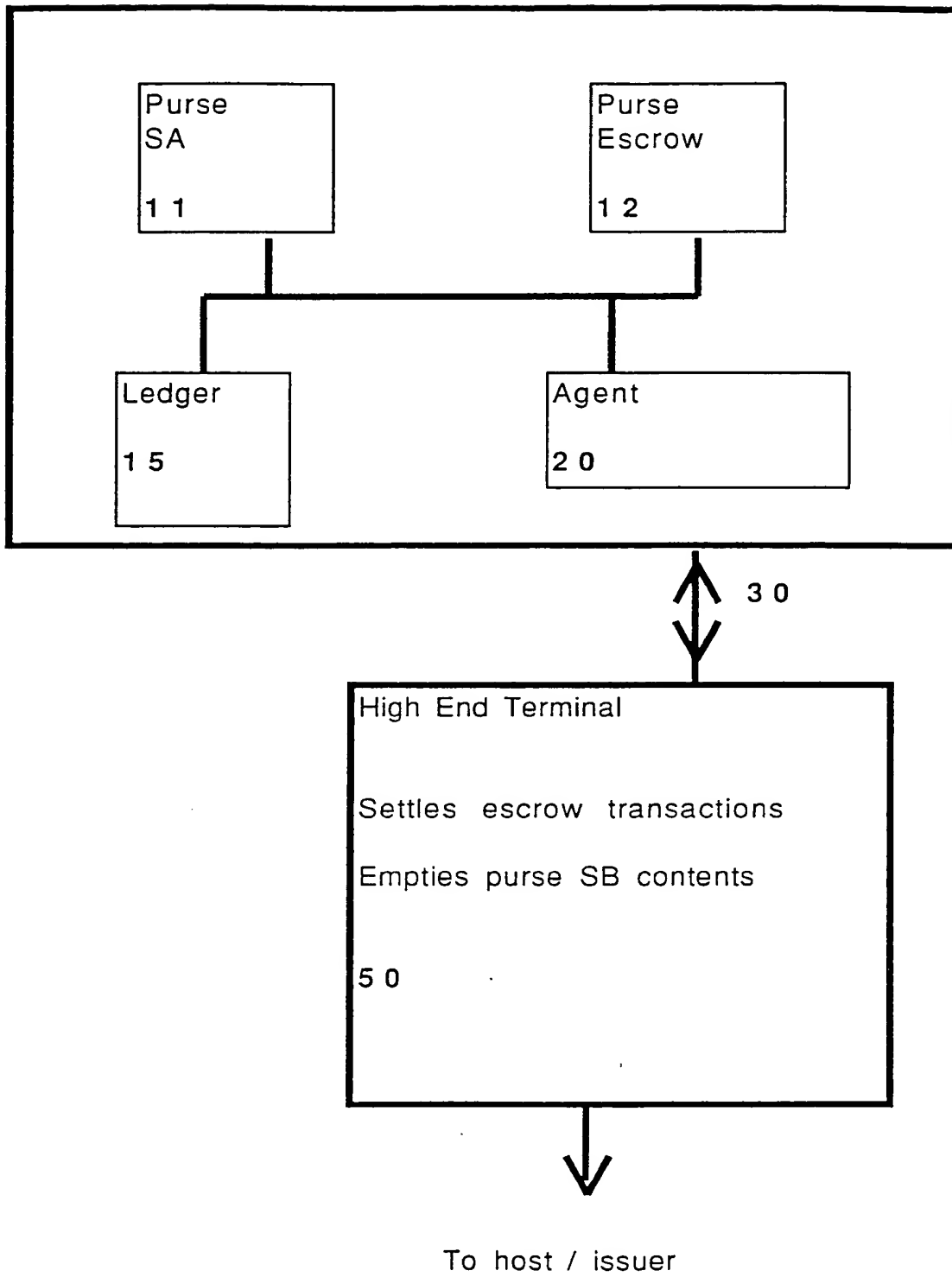


FIGURE 2

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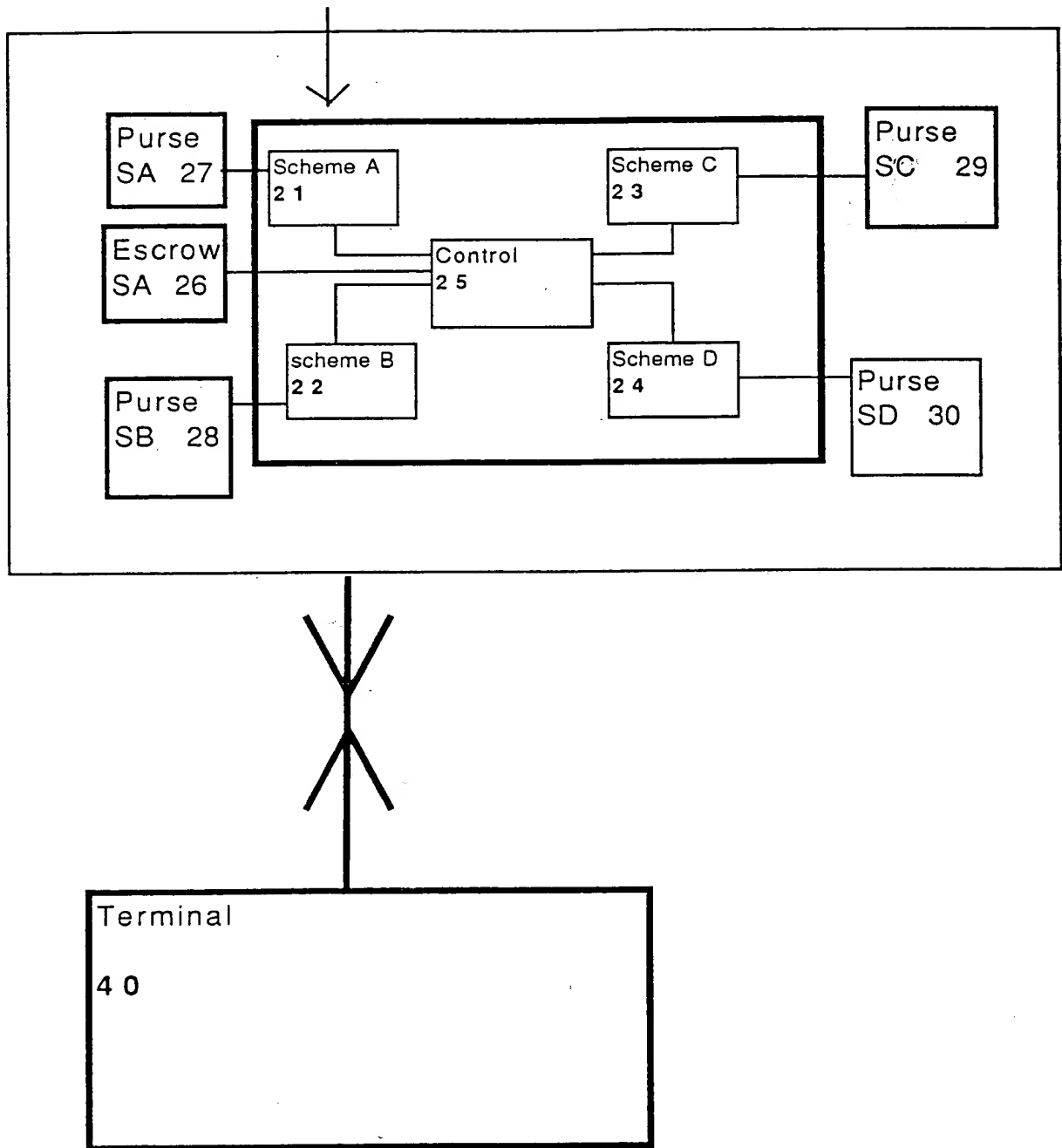


FIGURE 3